



476-1859

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE THE APPLICATION OF

Anslow, et al.

SERIAL NO.: 09/451,127

FILED: November 30, 1999

FOR: High Density Printed Wiring Board Having
In-Via Surface Mounting Pads

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) Examiner: Jeremy Norris
) Group Art Unit No. 2841
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20231, on June 14, 2001

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RESPONSE TO OFFICE ACTION OF MARCH 14, 2001

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

In response to the Examiner's first Office Action of March 14, 2001, it is requested
that the application be amended as follows:

In the Claims

Cancel claims 1-3 without prejudice, and substitute new claims 4-15 as follows:

4. (New) A printed circuit board comprising:-

- a) a plurality of spaced apart circuit layers;
- b) a blind hole/via extending between a surface circuit layer and at least one other circuit layer, said blind hole/via having an electrical connect layer which electrically connects said surface circuit layer to said at least one other circuit layer; and

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cancel'd.

c) a reflow pad for mounting a component to the surface circuit layer, said reflow pad being generally coincident with a surface part of said electrical connect layer.

5. (New) A printed circuit board as claimed in claim 4, wherein the surface part of the blind hole/via electrical connect layer extends a short distance over the surface of the surface circuit layer and wherein the reflow pad is located upon that part of the electrical connect layer that extends over the surface of the circuit layer.

6. (New) A printed circuit board as claimed in claim 4, wherein the reflow pad extends over the surface part of the blind hole/via electrical connect layer and also extends over a material filling the blind hole/via.

7. (New) A printed circuit board as claimed in claim 6, wherein the material filling the blind hole/via is a pre-peg material remaining in the hole from the manufacturing process of the board.

8. (New) A printed circuit board as claimed in claim 6, wherein the material filling the blind hole/via is an electro-conductive material.

9. (New) A method of manufacturing a printed wiring board, comprising the steps of:-

a) forming a plurality of spaced apart circuit layers including a blind hole extending between a surface circuit layer and at least one other circuit layer, said blind hole/via being formed to have an electrical connect layer to electrically connect said surface circuit layer and said at least one other circuit layer; and

b) forming a reflow pad to be coincident with a surface part of the blind hole/via electrical connect layer, said reflow pad being provided for mounting a component on the surface circuit layer.

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10. (New) A method as claimed in claim 9, wherein it includes the step of treating the surface part of the blind hole/via electrical connect layer to receive the reflow pad prior to forming the reflow pad thereon.
11. (New) A method as claimed in claim 10, wherein said method of treating comprises cleaning the surface part of the electrical connect layer by a pumice scrub process.
12. (New) A method as claimed in claim 9, wherein the step of forming a plurality of spaced apart circuit layers including a blind hole/via includes forming the blind hole/via electrical connect layer to extend a short distance over the surface of the surface circuit layer.

13. (New) A method as claimed in claim 12, wherein the reflow pad is formed to extend over the surface part of the blind hole/via electrical connect layer and to also extend over a material filling the blind hole/via.
14. (New) A method as claimed in claim 13, wherein the material filling the blind hole/via is a pre-peg material remaining in the blind hole from the step of forming the plurality of circuit layers and said method includes treating the exposed surface of said pre-peg material with a etchant to prepare it for receiving the reflow pad after having firstly completed the step of cleaning the surface part of the electrical connect layer by a pumice scrub process.
15. (New) A method as claimed in claim 12, wherein the material filling the blind hole/via is an electro conductive material placed in the blind hole/via prior to the step of forming the reflow pad.
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REMARKS

The Examiner's reconsideration of the application is requested in view of the new claims set forth above as well as the comments which follow below.

Turning first to the Requirement for Restriction, the election of claim 1 is confirmed.

Claim 1, however, has been cancelled and replaced by new claims 4-8. Claims 2 and 3, which are the non-elected claims, have been cancelled, and replaced by new claims 9-15.

As will become evident in the discussion below, it is submitted that all claims should

remain in the application, since the method claims are directed to the method of making the product of independent claim 4.

The Examiner has rejected claim 1 under 35 U.S.C. §103 as being obvious over Lebaschi U.S. Patent No. 5,764,485. Reconsideration is requested, both in view of the replacement of claim 1 with new claims 4-8, as well as the comments which follow below.

The Examiner has made reference to Figure 4 of this prior art reference in which he draws attention to the feature of the special occluding via cap 31 which blocks the via hole 30 to, as the reference testifies, "thereby eliminate the relatively involved procedure of otherwise necessarily filling the via hole 30 with solder before a solid connection is attained between the joining solder-joint 15 and associated via-pads 29" (see column 7, lines 19 to 23). This passage also confirms that a surface mount component is mounted to the pad 29 of the via hole 30 by means of a solder-joint 15 which is separate to the special occluding via cap 31 whose only function therefore is to close off the unfilled via hole 30. Apart from a reference at column 7, line 29 that the special occluding via cap 31 is conductive, Lebaschi remains entirely silent on its construction, composition and means of attachment to the via-pad 29.

The above should be contrasted with the present invention as now defined by new claim 4 which identifies that the essential feature of the present invention (refer to page 7, paragraph beginning line 18) is that a reflow pad is formed to be coincident with the blind hole/via rather than offset and connected to the blind hole via a narrow conductor line as was previously the practice. It will be noted that claim 4 has been drafted to define more

fully all the essential elements of the invention including the fact that the reflow pad is formed to be generally coincident with a surface part of the blind hole/via electrical connect layer. For the sake of comparison with Lebaschi, the Examiner will note that what is referred to in the present invention as "the surface part of the blind hole/via electrical connect layer" is equivalent to the via-pad 29 in Lebaschi.

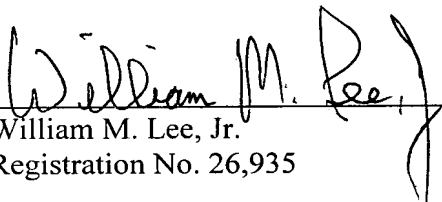
It is quite clear that, unlike the present invention, Lebaschi does not disclose the use of a reflow pad coincident with the via-pad 29 of that reference. The purpose of the reflow pad of the present invention is not to cover the blind hole/via but to provide a means of securing a surface mounting component to a surface of the printed wiring board. It does this using the known technique of reflow soldering. In preferred embodiments of the invention, the reflow pad is formed to be not only coincident with those portions of the blind hole/via electrical connect layer which extend a short distance radially outwardly over the surface circuit layer of the board but also any material filling the blind hole/via. This material may either be placed in the blind hole/via as a process step in the manufacture of the printed wiring boards of the invention or may be material remaining in the hole as a consequence of the manufacturing process.

Given the distinctions described above, it is quite clear that a person skilled in the art would not be motivated in any way by the teaching of Lebaschi to place a reflow pad over a blind hole as a means of blocking it. Consequently, it is quite clear that the present invention as now defined by new claim 4 is both novel and non-obvious having regard to the teaching of Lebaschi.

Referring now to the inclusion in the amended claim set of method claims 9-15, it is clear that the process as now claimed can be used to make only the product as defined by claim 4 and consequently the product and method claims define a single general inventive concept rather than distinct inventions. Thus, it is submitted that all claims should remain in this application.

In view of the foregoing, it is submitted that the application, as claimed, distinguishes from the prior art and is allowable there over. The Examiner's further and favorable reconsideration in that regard is urged.

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